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TRC

Comprehensive Groundwater Monitoring Plan

Phoenix-Goodyear Airport South Site
Goodyear, Arizona

Prepared for:

The Goodyear Tire & Rubber Company
1144 E. Market Street
Akron, OH 44316

Prepared by:

TRC
2300 Clayton Avenue, Suite 610
Concord, California

September 2012

The Goodyear Tire & Rubber Company
Akron, Ohio 44316 - 0001

September 21, 2012

Ms. Catherine Brown
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U.S. EPA Region 9
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San Francisco, CA 94105

Mr. Travis Barnum
Environmental Project Manager
Arizona Department of Environmental Quality
1110 West Washington Street
Phoenix, AZ 85007

Subject: Comprehensive Groundwater Monitoring Plan, 2012
Phoenix-Goodyear Airport (PGA) South Superfund Site, Goodyear, Arizona

Dear Ms. Brown and Mr. Barnum:

The Goodyear Tire and Rubber Company (GTRC) is providing the attached *Comprehensive Groundwater Monitoring Plan* (CGMP) for the Phoenix-Goodyear Airport (PGA) South Site, Goodyear Arizona, dated September 21, 2012. This CGMP was prepared to update the monitoring schedule and formalize recently agreed-upon changes to sampling and analytical protocols.

GTRC appreciates EPA's and ADEQ's previous informal review of the proposed CGMP changes. We concur with most comments and have incorporated these into the attached document. We have the following additional notes to provide, which we hope will aid your review.

Regarding EPA's/ITSI's comments emailed on September 14, 2012:

- GTRC agrees that additional quarterly sampling of wells EMW-08R, EMW-10R, EMW-11R, EMW-12R, and EMW-14R would be beneficial to help establish trends. As such, we have added a note to Table 2 which indicates that quarterly sampling will continue through February 2013 (comprising one full year), and will reduce to semiannual thereafter.

- Well EMW-26 was abandoned in 1996; this will be indicated in the final document figures. Well NEW-09, as we understand it, is immediately adjacent to a private production well, and thus likely would not be generally representative of water levels in that area.

Regarding ADEQ's comments emailed on September 19, 2012:

- GTRC concurs with ADEQ's suggestion to monitor water levels in EMW-09. GTRC may be able to request water level data from PMW-06, -08, and -15 through -17, as the City of Phoenix may collect these data as part of their monitoring program; however, due to access and potential liability issues, GTRC would prefer not to sample/monitor any PMW wells directly.

Some final notes:

- Due to the presence of piping and equipment, it is not possible to collect water levels from E-102 and E-202. The information sent by GTRC for informal review indicated that water levels would be collected from these wells; this was an error that is corrected in the attached document.

- Due to the presence of inoperable equipment in E-08 and E-11, these wells cannot be sampled as indicated in the information sent for informal review. GTRC is recommending that these be removed from the CGMP, as delineation coverage is provided by nearby wells, as detailed in Table 2.

If you have any questions, please call me at (330) 796-7430.

Sincerely,

Jeff Sussman

Jeff Sussman
Project Manager

Attachment: Subunit A Well Replacement Work Plan, Phoenix-Goodyear Airport (PGA) South Superfund Site, Goodyear, Arizona

cc: N. Nesky, ITSI (electronic copy and hard copy)
A. Gu / D. Fisher, ITSI (electronic copy only)
G. Bruck, USEPA (electronic only)
M. Long, Hargis & Assoc. (electronic copy)
S. Rode / J. Postema, City of Goodyear (electronic copy)
J. Littell / C. Legg, Brown & Caldwell (electronic only)
J. Husband, City of Phoenix Aviation (electronic only)
R. Clark, GTRC (electronic only)
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Comprehensive Groundwater Monitoring Plan
DRAFT

September 21, 2012

Phoenix-Goodyear Airport South Site
Goodyear, Arizona

Prepared For:

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Comprehensive Groundwater Monitoring Plan
Phoenix-Goodyear Airport (PGA) South Site
Goodyear, Arizona

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ACRONYMS

ADEQ	Arizona Department of Environmental Quality
ADHS	Arizona Department of Health Services
CD	Compact disk
CGMP	Comprehensive Groundwater Monitoring Plan
CO	Consent Order
COC	Constituent of Concern
COG	City of Goodyear
COP	City of Phoenix
Cr(VI)	Chromium VI
EDD	Electronic data deliverable
GAC	Granular activated carbon
gpm	Gallons per minute
GTRC	Goodyear Tire & Rubber Company
MCL	Maximum Contaminant Level
MS/MSD	Matrix spike and matrix spike duplicate
µg/L	Micrograms per liter
NPL	National Priorities List
O&M	Operations and Maintenance
PGA	Phoenix-Goodyear Airport
PGAS	Phoenix-Goodyear Airport South
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
RI	Remedial Investigation
ROD	Record of Decision
SOP	Standard Operating Procedure
SVE	Soil Vapor Extraction
TCE	Trichloroethene
USEPA	U.S. Environmental Protection Agency
VOC	Volatile Organic Compound

1.0 INTRODUCTION

The purpose of this Comprehensive Groundwater Monitoring Plan (CGMP) is to provide guidance for conducting routine groundwater monitoring activities at the Goodyear Tire & Rubber Company (GTRC) Phoenix-Goodyear Airport South Site (PGAS). This plan is one component of the overall monitoring program for the groundwater remedies required by Section VII of the 1991 Consent Decree (USEPA, 1991). Other components, which are contained in separate documents, are Operations and Maintenance (O&M) Manuals for Subunit A and Subunit C Treatment Systems (LATA, 2007a, 2008), Quality Assurance Project Plan (QAPP) (TRC and LATA, 2009), Health and Safety Plan (TRC, 2010), and Emergency Action Plan (LATA, 2007b).

This CGMP was prepared as a replacement to the CGMP (LATA, 2009a) in order to update the locations, frequency, and methods for sampling at PGAS. Standard Operating Procedures (SOPs) for the sampling techniques are included in the QAPP.

This CGMP follows requirements specified in Sections VII through X of the Consent Decree between the United States of America, the State of Arizona, GTRC, and the Loral Defense Systems-Arizona (a division of the Loral Corporation) lodged November 27, 1991 (Civil Action No. 88-1443 PHX EHC). The Operable Unit Remedy Operation and Maintenance procedures outlined in the 1987 Consent Agreement for Operable Unit for Groundwater Monitoring were superseded by the 1991 Consent Decree with adoption of the Comprehensive Groundwater Monitoring Plan (Subparagraph VII.C.9). This plan follows the United States Environmental Protection Agency (USEPA) Guidance on Remedial Actions for Contaminated Ground Water at Superfund Sites.

2.0 BACKGROUND AND SITE HISTORY

PGAS is located 17 miles west of Phoenix, Arizona, in the western part of the Salt River Valley. The site comprises an area of approximately four square miles and encompasses the Phoenix-Goodyear Airport (PGA, formerly known as the Phoenix-Litchfield Naval Air station), the JRC Goodyear property (formerly owned by Goodyear Aerospace Corporation) and limited properties immediately adjacent to the airport, which are commercial, industrial, and agricultural in nature. The site location is depicted on Figure 1.

Historically, the site was used by the United States Navy for preservation and activation of decommissioned military aircraft. Goodyear Aerospace Corporate used the property for manufacturing aerospace-related products. The majority of the waste streams generated were attributed to metal treatment processes and included trichloroethene (TCE), chromium sludge from chrome-plating operations, acids, and process wastewater.

In 1981, the Arizona Department of Health Services (ADHS) discovered that the groundwater underlying the PGA area was impacted by industrial solvents and chromium. Additional groundwater sampling was conducted in 1982 and 1983 by ADHS and the USEPA. The PGA site was formally listed on the National Priorities List (NPL) on September 8, 1983. In 1984, the USEPA initiated a Remedial Investigation (RI) of the PGA area to explore the nature and extent of the contamination and the exposure pathways and receptors of hazardous contaminants. Results from the RI indicated TCE impacts in a cluster of production wells located within one-half mile of the Goodyear Aerospace Corporation facility. In addition, some wells had chromium VI [Cr(VI)] present above remedial action goals.

The upper 300 feet of the valley fill, called the Upper Alluvial Unit (AGS, 1992), is the hydrologic unit of concern at the site. This unit is divided into three subunits. Subunit A, an unconfined

upper aquifer, extends from the ground surface to approximately 110 feet below grade. Subunit B, a semi-confining unit which limits/restricts the flow of groundwater between Subunits A and C, extends from approximately 110 to approximately 170 feet. Subunit C, a semi-confined lower aquifer, extends from approximately 170 to approximately 300 feet below the surface.

PGAS has been undergoing active treatment for TCE for over 20 years. The primary treatment technology used at the site has been and is currently groundwater extraction with ex situ treatment (i.e., pump and treat). In addition, soil vapor extraction (SVE) and air sparging have been conducted in some areas. The pump and treat system for Subunit A uses an air stripper for removal of TCE from the groundwater. The system for Subunit C uses granular activated carbon (GAC) for TCE treatment. In the mid-1990s, an ex situ chromium treatment system was installed to treat water from select wells where chromium was above remedial action goals. This system did not prove viable and was taken off-line in 2003. Currently, chromium is not actively treated. Water extracted for TCE treatment that contains chromium above remedial action goals is blended with water that is not impacted by chromium. After treatment for TCE through the air stripping unit, the water is re-injected.

Additional background information can be found in the following documents:

- USEPA, 1989. *Remedial Investigation/Feasibility Study, Phoenix-Goodyear Airport*, Goodyear, Arizona, prepared by CH2M-Hill, EPA Contract No. 68-01-7251, Work Assignment No. 309L19.0. June 7.

- USEPA, 1989b. *Record of Decision, Phoenix-Goodyear Airport Superfund Site, Goodyear, Arizona.* September.

- USEPA, 1991. *Consent Decree: United States of America, State of Arizona; Plaintiffs vs. The Goodyear Tire and Rubber Company, Loral Defense Systems-Arizona, a division of Loral Corporation; Defendants*, Civil Action No. 88-1443 PHX EHC.

- Metcalf & Eddy, Inc. 1991. *Work Plan: Pre-Remedial Design Field Investigation Subunit B/C Phoenix-Goodyear Airport Superfund Site*, Goodyear, Arizona, prepared for the Goodyear Tire & Rubber Company. February 21.

- Sharp and Associates, Inc. 1992. *Contaminant Transport/Well Evaluation Report, Phoenix Goodyear Airport Site*, Goodyear, Arizona. October 22.

- Sharp and Associates, Inc. and HWH Architects, Engineers, Planners, Inc. 1993. *Final Design Report for the Subunit B/C Ground Water Remedy at the Phoenix-Goodyear Airport Site* in Goodyear, Arizona, prepared for the Goodyear Tire & Rubber Company. March 10.

- Sharp and Associates, Inc. 2003. *Comprehensive Groundwater Monitoring Plan.* April.

- USEPA, 2005. *Five Year Review Report for Phoenix-Goodyear Airport (South) Superfund Site, Goodyear, Arizona.* September.

3.0 OBJECTIVES

The objectives of this CGMP are to:

- Provide guidance for collection of water level data in order to evaluate and

demonstrate hydraulic capture of contaminants in excess of cleanup goals;
- Provide guidance for collection of water quality data to monitor the progress of the groundwater remediation;
- Provide a schedule of analytes and frequencies for groundwater monitoring; and
- Provide a schedule of analytes and frequencies for collection of effluent samples from the treatment plants to verify compliance with discharge limits.

4.0 PLUME DEFINITION AND HYDRAUIC CONTROL

Table 1 lists the remedial action goals for the primary constituents of concern (COCs) at the site - TCE and chromium. These remedial action goals were presented in the 1989 Record of Decision (USEPA, 1989a). There are three areas of groundwater contamination at the site: Subunit A, the Subunit C southern plume, and the Subunit C northern plume. Groundwater monitoring data are used to define the plume boundaries per the remedial action goals, track remediation progress, and demonstrate hydraulic control provided by the existing remediation systems.

4.1 Subunit A

Groundwater extraction and treatment to remove TCE began in December 1989 with five extraction wells (NE-01, NE-02, NE-03, NE-04, and NE-05), an air stripper, and seven injection wells. The system was expanded in 1992 with the addition of five extraction wells (E-07, E-08, E-10, E-11, and E-12) and nine injection wells to address the northern portion of the plume. In 1993, wells E-17 and E-07R were drilled and later brought on line, and in 1994 well E-16 was drilled and later brought on line. Currently, there are 7 extraction wells and 16 injection wells used for removal of contaminated groundwater and reinjection of the treated water.

Figure 2 presents the most current disposition of the Subunit A TCE plume (TRC, 2012a), defined to the remedial action goal of 5 micrograms per liter (µg/L, Table 1). The 5 µg/L encompasses approximately 240 acres, which represents a decrease from approximately 420 acres in 1990. The highest concentration of TCE in the Subunit A aquifer in May 2012 was 210 µg/L, representing a significant decrease from the maximum of 2,600 µg/L in 1990.

Figure 3 presents the most current disposition of the Subunit A chromium plume, defined to the remedial action goal of 100 µg/L. Chromium impacts in Subunit A are of limited extent; only wells E-17 and EMW-08R currently have concentrations above the remedial action goal.

Hydraulic control in Subunit A is maintained by pumping groundwater from the extraction well network. Pumping rates for these wells typically range from 20 gallons per minute (gpm) to 100 gpm. Since the groundwater extraction and treatment process began, the TCE isoconcentration contours and potentiometric maps have demonstrated that the TCE plume is no longer migrating, and that the remediation to date has been effective in reducing the both concentrations and contaminant mass. The plume boundary has historically been well defined from analytical results derived from perimeter monitoring points.

4.2 Southern Subunit C

Figures 4 and 5 show the current disposition of the TCE and chromium plumes, respectively, in Subunit C. In 1994, the southern Subunit C extraction system originally consisted of three extraction wells (E-201, E-202, and E-203) and three injection wells (I-201, I-202 and I-203). Active extraction in southern Subunit C ceased in 2009, after the TCE cleanup goal had been

met for four quarters, and following submittal and agency approval of a pulsed pumping approach (LATA, 2009b). Southern Subunit C wells continue to be monitored per this CGMP, and extraction could re-commence, if necessary.

4.3 Northern Subunit C

The northern Subunit C extraction system originally consisted of a single extraction well (E-101) and two injection wells (I-101 and I-102). In 2004, an additional extraction well (E-102) was brought on line to address capture of the western edge of the northern Subunit C TCE plume, and E-101 was taken off-line. Hydraulic control in northern Subunit C is currently being maintained by pumping groundwater from E-102. Operation of production well GAC-02, by JRC Goodyear, also supports hydraulic containment. Average pumping rates from E-102 and GAC-02 are approximately 210 gpm and 300 gpm, respectively.

5.0 SAMPLING LOCATIONS AND FREQUENCY

The CGMP is intended to monitor:

- Plume migration, expansion, or reduction;
- Trends in COC concentrations;
- The effectiveness of the pump and treat systems to reduce concentrations and mass of COCs in the groundwater,
- The effectiveness of the pump and treat systems to control the migration of the contaminant plumes; and
- Compliance with regulatory requirements, such as Consent Orders, for the site.

Wells are evaluated for inclusion in the monitoring program based on an assessment of data trends both temporally from individual wells and spatially for the plume as a whole. The QAPP provides additional detail regarding the procedures used to determine which wells should be sampled, sampling frequency, and analytical suite.

Table 2 presents the well, analyte, and monitoring frequency schedule, including a brief description of data uses and rationale for change from the 2009 CGMP (LATA, 2009), if any. Many of the indicated changes for southern Subunit C wells were first proposed and agency-approved in 2011 (TRC, 2011a), and are being formalized within this CGMP. These wells are referenced in Table 2.

The wells to be sampled are depicted in Figures 6 and 7 for Subunits A and C, respectively. The wells to be gauged for water level measurements are depicted in Figures 8 and 9 for Subunits A and C, respectively.

In addition to the monitoring performed by GTRC for PGAS, select Subunit A wells are being monitored by the City of Phoenix (COP) in response to a historical aviation fuel release. COP monitors some of these wells for TCE, and the results are shared with PGAS, and are thus made part of this CGMP (Table 2).

6.0 SAMPLING AND ANALYTICAL PROCEDURES

The groundwater monitoring program includes the measurement of groundwater levels in designated wells (Table 2), collection of field measurements, and analysis of groundwater samples by an Arizona-certified analytical laboratory. The QAPP, a companion document to this CGMP, contains the SOPs that detail the methods to be followed for data collection, as well as laboratory

sampling methods, preservatives, holding times, and container requirements. This section presents a brief overview of field methods and sampling procedures, the QAPP and associated SOPs are considered to be and must be used as the guiding documents for data collection.

6.1 Water Level Measurements

Groundwater level measurements comprise gauging the depth to groundwater. Total depth of the well can also be measured, when necessary and possible (given the presence of pumping equipment in some wells). SOP 5 of the QAPP, *Water Level and Free Product Measurement,* provides detailed information. Whenever possible, the water level measurements at PGAS are collected on the same days as measurements from the PGA North, Western Avenue, and COP aviation gas release monitoring wells. Measurements are typically collected within a 48-hour period of time to minimize variables, such as irrigation pumping and weather. PGAS and nearby off-site water level data are used to prepare potentiometric surface maps for the site.

6.2 Well Sampling

Samples are collected from monitoring wells, extraction wells, and active production wells. To date, monitoring wells have been purged using low-flow methods prior to sampling, as detailed in SOP 1 of the QAPP, *Purging and Sampling Wells.* This CGMP will employ a passive sampling technique via the use of HydraSleeves™. Side-by-side low-flow and HydraSleeve™ sampling studies were conducted at PGAS in February and August 2011, and it was concluded that the two methods produced similar analytical results, and that HydraSleeve™ sampling was a viable alternative to low-flow at the site (TRC, 2012b).

The sampling procedure described in SOP 6, *HydraSleeve™ Groundwater Sampling*, had been reviewed and accepted by the USEPA for use at the site prior to execution of the HydraSleeve™ comparison studies. Concurrent with this CGMP, under separate cover, SOP 6 is being submitted for formal approval as an amendment to the QAPP.

At PGAS, the HydraSleeves™ will generally be deployed at each well immediately following the water level measurement, and retrieved a minimum of 24 hours later. Appendix A provides well construction details, including screen interval and total depth, to allow field personnel to calculate the appropriate Hydrasleeve™ deployment depth.

Extraction, injection, and production wells are purged prior to sampling by opening the sampling port and allowing the water to run for at least two minutes.

Samples are handled, packaged, and shipped in accordance with SOP 4, *Sample Packaging and Shipping*. All non-dedicated equipment is decontaminated prior to and following each use in accordance with SOP 3, *Equipment Decontamination.*

6.3 Treatment System Sampling

The influent and effluent streams at the Subunit A and Subunit C treatment systems are sampled monthly, as specified in Table 2. The purpose of collecting and analyzing these samples is to verify the efficiency and effectiveness of the treatment system. The monthly frequency assures that if there are system issues, they are discovered and remedied in a timely manner.

For the Subunit A treatment system, influent and effluent samples are collected at the air stripper. For the Subunit C treatment system, samples are collected from the sample ports on the influent and effluent lines leading into and out of the primary GAC unit.

6.4 Quality Assurance/Quality Control Samples

The quality control (QC) samples include trip blanks, duplicate samples, and matrix spike samples. Equipment rinsate blanks are not required with HydraSleeve™ sampling, because the HydraSleeves™ are dedicated to individual wells and used only once.

The QC samples are described below:

- Trip Blank - one per day for sampling days that involve volatile organic compounds (VOCs); the trip blank is supplied by the laboratory and accompanies the shipped samples.
- Duplicate – collected at a 10 percent frequency at high concentration wells (if known), using different wells for different sampling events, and submitted blind (without identification of the well) to the laboratory.
- Matrix Spike and Matrix Spike Duplicate (MS/MSD) - collected at a frequency of 5 percent, at twice the usual volume and at high concentration wells (if known). Sample containers are labeled with the sample identification number and "MS/MSD" designated in the comment section of the chain of custody document to inform the laboratory that a site-specific sample is to be used for MS/MSD analyses.

The methodology for collecting duplicate samples is generally the same as for regular samples; however, sample vials are filled in a specific sequence, specified in the QAPP. For example, for VOC analysis, the first vial of the primary sample is filled, followed by the first vial of the duplicate sample, and so on, until all vials are filled.

6.5 Analytical Methods

As outlined in the QAPP, VOCs (i.e., TCE) are analyzed by EPA Method 8260B, and chromium is analyzed by EPA Method 6010A. Sampling container requirements, preservatives, and holding times are provided in the QAPP.

Well samples for chromium will be analyzed both unfiltered (in compliance with the current ROD and QAPP requirements) and filtered. Site-specific studies/analyses (TRC 2011b, TRC 2012c) have demonstrated that unfiltered, field-preserved chromium samples can present a conservatively elevated estimate of total (unspeciated) dissolved chromium, particularly in samples with high turbidity. The elevated total dissolved chromium concentrations are a result of the preservation (acidification) process, which mobilizes any Cr(III) present in particulate matter into the dissolved phase. Without acidification, this Cr(III) is generally not mobile, i.e., not available for dissolution in groundwater. Analysis of filtered, and then preserved (filtration and preservation will occur at the laboratory), groundwater samples for total dissolved chromium therefore presents a more consistent and accurate representation of the true chromium impacts to groundwater. As part of a pending ROD Amendment or Explanation of significant Differences (ESD) to address chromium in Subunit C groundwater, GTRC will be requesting the approval to use solely filtered sample results to determine compliance with the ROD.

For well samples analyzed for chromium, turbidity will be measured in the field, with electronic equipment. SOP 2, *Equipment Calibration,* describes calibration procedures to be used for field parameter measuring equipment.

6.6 Disposal of Investigation Derived Waste

Purge water from sampling activities will be contained in a non-potable water tank and disposed of by treatment through the PGAS Subunit A treatment system. Other investigation derived waste material will be containerized, labeled, and disposed of in accordance with applicable regulations.

7.0 REPORTING AND RECORDKEEPING

Reporting and recordkeeping are addressed in detail in the QAPP. In general, data are provided from the laboratory in an electronic format as an electronic data deliverable (EDD). The EDD information is transferred to the site database. Data are qualified using Arizona Data Qualifiers and are reviewed for quality and usability by the database manager.

Monitoring well data are reported on a semi-annual basis. The semi-annual report provides an evaluation of the data collected, and describes data collection procedures and treatment system operational status (e.g., TRC, 2012a). The report also addresses quality assurance/quality control (QA/QC), any deviations from the CGMP, and data usability. The report includes a compact disc (CD) with the analytical data in an electronic format. Report contents are more fully described in the QAPP.

Influent and effluent sample results are reported in the semi-annual monitoring reports, and are also reported in the Monthly Progress Report. These monthly reports also provide information on mass removal, system operation, and QA/QC.

Records are maintained in accordance with USEPA guidance, as described in the QAPP.

8.0 REFERENCES

Arizona Geological Survey, 1992, *Geologic Map and Cross-Section of Arizona: Map 14 Explanation.*

Los Alamos Technical Associates, Inc. 2007a, *Operations and Maintenance Manual for Southern Subunit C Treatment System at the Phoenix-Goodyear Airport South Site (PGA South).* August.

Los Alamos Technical Associates, Inc. 2007b, *Phoenix-Goodyear Airport Water Treatment Plant Emergency Action Plan.* December.

Los Alamos Technical Associates, Inc. 2008, *Operations and Maintenance Manual for Subunit A Treatment System at the Phoenix-Goodyear Airport South Site (PGA South).* June.

Los Alamos Technical Associates, Inc. 2009a, *Comprehensive Groundwater Monitoring Plan for the Phoenix-Goodyear Airport South Site.* February.

Los Alamos Technical Associates, Inc. 2009b, *Technical Memo Proposing Treatment System Modification through Pulsed Pumping at the Southern Subunit C Groundwater Plume for the Phoenix-Goodyear Airport South Site.* May.

TRC, 2010, *Site-Specific Health and Safety Plan, Groundwater Monitoring and Sampling, Phoenix-Goodyear Airport Superfund Site.* August.

TRC, 2011a, *Technical Memorandum, Southern Subunit C Well Sampling Program Modifications, Phoenix-Goodyear Airport Superfund Site.* March.

TRC, 2011b, *Technical Memorandum, Proposed Subunit C Chromium Sampling and Analysis Evaluation, Phoenix-Goodyear Airport Superfund Site.* March.

TRC, 2012a, *First Semiannual 2012 Groundwater Monitoring Report, Phoenix-Goodyear Airport Superfund Site.* August.

TRC, 2012b, *HydraSleeve Comparison Study, Technical Memorandum, Phoenix-Goodyear Airport Superfund Site.* January.

TRC, 2012c, *Technical Memoradnum – Subunit C Chromium Sampling and Analysis Evaluation, Phoenix-Goodyear Airport Superfund Site.* January.

TRC and Los Alamos Technical Associates, 2009, *Quality Assurance Project Plan, Phoenix-Goodyear Airport Superfund Site.* October.

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TABLES

Table 1

Remedial Action Goals - Subunit A and C

Comprehensive Groundwater Monitoring Plan - September 2012

Analyte	Remedial Action Goal (µg/L)[a]	Rationale for change, if any
Phoenix-Goodyear Airport South Constituents of Concern		
Trichloroethene	5	No change from Table 2-5 of 1989 ROD
Chromium	100	**Previously at 50 µg/L based on proposed MCL; current MCL is 100 µg/L**
Constituents Listed in Regulatory Documents for the Site		
1,1-Dichloroethene	7	No change from Table 2-5 of 1989 Record of Decision (ROD)
1,2-Dichoropropane	1	No change from Table 2-5 of 1989 ROD
Chloroform	100	No change from Table 2-5 of 1989 ROD
Toluene	**1,000**	**Previously at 340 µg/L based on Arizona Department of Environmental Quality (ADEQ) water action level: current Maximum Contaminant Level (MCL) is 1,000**
Trichlorofluoromethane	1	No change from Table 2-5 of 1989 ROD
Carbon Tetrachloride	5	No change from Table 2-5 of 1989 ROD
Methylene Chloride	1	No change from Table 2-5 of 1989 ROD
Methyl Ethyl Ketone (MEK)	350	Revised groundwater clean-up level established in 1991 Explanation of Significant Difference (ESD)
Xylenes	440	No change from Table 2-5 of 1989 ROD
Antimony	1.46	No change from Table 2-5 of 1989 ROD
Arsenic	50	No change from Table 2-5 of 1989 ROD
Barium	**2,000**	**Previously at 1,000 µg/L based on previous MCL; current MCL is 2000 µg/L**
Beryllium	**0.004**	**Previously at 0.0039 µg/L, risk based; current MCL is 0.004 µg/L**
Cadmium	5	**Previously at 10 µg/L based on previous MCL; current MCL is 5 µg/L**
Lead	15	**Previously at 50 µg/L based on MCL; current EPA action level is 15µg/L**
Mercury	2	No change from Table 2-5 of 1989 ROD
Nickel	100	**Previously at 15.4 µg/L based on Ambient Water Quality Standard for drinking water because an MCL was not established; current MCL is 100 µg/L**
Selenium	50	**Previously at 10 µg/L based on previous MCL; current MCL is 50 µg/L**
Silver	50	No change from Table 2-5 of 1989 ROD
Zinc	**5,000**	No change from Table 2-5 of 1989 ROD
Acetone	700	New groundwater clean-up level established by the 1991 ESD #1
Benzene	5	New groundwater clean-up level established by the 1993 ESD #2
Ethylbenzene	700	New groundwater clean-up level established by the 1993 ESD #2
Tetrachloroethylene	5	New groundwater clean-up level established by the 1993 ESD #2
1,1,2,2-Tetrachlorethane	0.18	New groundwater clean-up level established by the 1993 ESD #2

[a]Micrograms per liter

Source: March 1989 ESD #4 for Phoenix-Goodyear Airport, page 16.

Table 2
Groundwater Monitoring Program - Analytes and Frequency
Comprehensive Groundwater Monitoring Plan - September 2012

Well #	Subunit/ Location	Type	WL	Monthly	Quarterly	Semiannual	Annual	Description	Reason for Change
E-03	A	MW	x			TCE		Boundary well	No change
E-04	A	MW	x		TCE			Interior well	No change
E-07R	A	EW		Cr	TCE			Active extraction well; interior plume	No change
E-08	A	EW						Remove from CGMP	Former extraction well; contains inoperable pump and equipment; delineation coverage is provided by EMW-03.
E-11	A	EW						Remove from CGMP	Former extraction well; contains inoperable pump and equipment; boundary coverage is provided by EMW-13 and EMW-07R (pending).
E-12	A	EW		Cr	TCE			Active extraction well; interior plume	No change
E-16	A	EW	x				Cr/TCE	Active extraction well; low concentrations (boundary control)	No change
E-17	A	EW	x	Cr		TCE		Active extraction well; interior plume	No change
EMW-03	A	MW	x			Cr/TCE		Interior well	Increase TCE to semiannual for better delineation near EMW-4, which is dry
EMW-04	A	MW						Remove from CGMP	Dry well; can no longer be sampled; use EMW-03 for delineation coverage

Groundwater Monitoring Program - Analytes and Frequency
Comprehensive Groundwater Monitoring Plan - September 2012

Well #	Subunit/ Location	Type	WL	Monthly	Quarterly	Semiannual	Annual	Description	Reason for Change
EMW-05	A	MW						Remove from CGMP	Dry well; can no longer be sampled; EMW-06 and E-08R provide sufficient delineation coverage
EMW-06	A	MW	x			Cr/TCE		Interior well	Increase TCE to semiannual for better delineation near EMW-05, which is dry
EMW-07R (installation pending)	A	MW	x			TCE		Boundary well	Boundary well; replacement well for EMW-07, which is dry (installation pending)
EMW-08R *	A	MW	x		See note *	Cr/TCE		Interior well	Interior well; replacement well for EMW-08; increase Cr from annual to semiannual given elevated concentrations
EMW-09	A	MW	x					WL only	GAC-4 is abandoned; monitoring no longer needed; EMW-10R provides delineation coverage
EMW-10R *	A	MW	x		See note *	Cr/TCE		Interior well	Interior replacement well; add Cr to improve delineation
EMW-11R *	A	MW	x		See note *	Cr/TCE		Interior well	Interior replacement well; increase Cr from annual to semiannual to improve delineation
EMW-12R *	A	MW	x		See note *	TCE		Interior well	Interior replacement well
EMW-13	A	MW	x			TCE		Boundary well	No change
EMW-14R *	A	MW	x		See note *	Cr/TCE		Interior well	Interior replacement well
EMW-15	A	MW	x			TCE		Boundary well	Increase to semiannual to better define trends with NE-05 off line

Groundwater Monitoring Program - Analytes and Frequency
Comprehensive Groundwater Monitoring Plan - September 2012

Well #	Subunit/ Location	Type	WL	Monthly	Quarterly	Semiannual	Annual	Description	Reason for Change
EMW-16	A	MW	x				TCE	Boundary well	No change
EMW-29A	A	MW	x					WL only	No change
EO-01	A	EO	x					WL only	No change
EO-02	A	EO	x					WL only	No change
EO-03	A	EO	x					WL only	No change
EO-04	A	EO	x					WL only	No change
EO-05	A	EO	x					WL only	No change
EO-07	A	EO	x					WL only	No change
EO-12	A	EO	x					WL only	No change
EO-17	A	EO	x					WL only	No change
EP-02R (installation pending)	A	MW	x			Cr/TCE		Replacement boundary well	Boundary well; replacement well for EP-02, which is dry (installation pending); increase Cr to semiannual to better monitor trends
GMW-03	A	MW	x			TCE		Upgradient boundary well	No change
GMW-04	A	MW	x				TCE	Upgradient boundary well; far from plume boundary	No change
GMW-06	A	MW	x				Cr/TCE	Interior well	No change
GMW-24A (installation pending)	A	MW	x		TCE			New interior well	Fill data gap between NEW-03 and E-04 (installation pending)
GP-01	A	MW						Remove from CGMP	Dry well; can no longer be sampled
GP-02	A	MW						Remove from CGMP	Dry well; can no longer be sampled; formerly used specifically for GAC-04 study, which is complete. EMW-10R provides delineation coverage.

Groundwater Monitoring Program - Analytes and Frequency
Comprehensive Groundwater Monitoring Plan - September 2012

Well #	Subunit/ Location	Type	WL	Monthly	Quarterly	Semiannual	Annual	Description	Reason for Change
IO-01	A	IO	x					WL only	No change
IO-02	A	IO	x					WL only	No change
IO-04	A	IO	x					WL only	No change
IO-05	A	IO	x					WL only	No change
IO-06	A	IO	x					WL only	No change
IO-07	A	IO	x					WL only	No change
IO-08	A	IO	x					WL only	No change
IO-09	A	IO	x					WL only	No change
IO-10	A	IO	x					WL only	No change
IO-12	A	IO	x					WL only	No change
IO-13	A	IO	x					WL only	No change
IO-14	A	IO	x					WL only	No change
IO-16	A	IO	x					WL only	No change
IO-17	A	IO	x					WL only	No change
IO-18	A	IO	x					WL only	No change
NE-01	A	MW						Remove from CGMP	Former extraction well; contains inoperable pump and equipment; when sampled, had been non-detect since 2000.
NE-02	A	EW			Cr/TCE			Active extraction well	Increase TCE to quarterly to better define trends
NE-03	A	EW			Cr/TCE			Active extraction well	No change
NE-04	A	EW			Cr/TCE			Active extraction well	No change
NE-05	A	EW						Remove from CGMP	Damaged extraction well; EMW-14R and NE-04 provide delineation coverage.
NEW-01	A	MW	x		TCE			Downgradientmost well	No change
NEW-03	A	MW	x			Cr/TCE		Interior well	Add Cr analysis to better monitor trends
NEW-04	A	MW					TCE	Boundary well	No change
PMW-03	A	MW						Remove from CGMP	No longer sampled by COP

Groundwater Monitoring Program - Analytes and Frequency
Comprehensive Groundwater Monitoring Plan - September 2012

Well #	Subunit/ Location	Type	WL	Monthly	Quarterly	Semiannual	Annual	Description	Reason for Change
PMW-06	A	MW					TCE	Boundary area data point sampled by COP	Currently sampled by COP
PMW-08	A	MW					TCE	Boundary area data point sampled by COP	No change
PMW-14	A	MW						Remove from CGMP	No longer sampled by COP
PMW-15	A	MW					TCE	Boundary area data point sampled by COP	No change
PMW-16	A	MW					TCE	Boundary area data point sampled by COP	No change
PMW-17	A	MW					TCE	Boundary area data point sampled by COP	Currently sampled by COP
COG-01	NC	CPW						Remove from CGMP	Not needed for delineation given location upgradient of MCL plume; also, monitored by others
COG-05	NC	CPW	x		Cr/TCE			Interior well near boundary	Add Cr analysis to better monitor trends
COG-07	C	CPW						Remove from CGMP	Well cannot be located on maps and has not been sampled for many years
COG-11	C	CPW		TCE				Active supply well	No change
COG-20	C	CPW		TCE				Active supply well	No change
E-101	NC	EW			TCE			Boundary well	No change
E-102	NC	EW			TCE		Cr	Boundary well	No change

Groundwater Monitoring Program - Analytes and Frequency
Comprehensive Groundwater Monitoring Plan - September 2012

Well #	Subunit/ Location	Type	WL	Monthly	Quarterly	Semiannual	Annual	Description	Reason for Change
E-201	SC	EW	x		TCE			Boundary well	No change
E-202	SC	EW						Remove from CGMP	Equipment present in well prevents WL from being measured; was WL only in 2009.
EMW-02	SC	MW	x					WL only	No change
EMW-19LC	SC	MW	x					WL only	No change
EMW-20LC	SC	MW	x				TCE	Boundary well	No change
EMW-20UC	SC	MW					TCE	Boundary well	No change
EMW-21UC	SC	MW	x				TCE	Boundary well	Analytes and frequency modified pursuant to TRC Tech Memo (3/15/11)
EMW-22LC	SC	MW	x					WL only	No change
EMW-28LC	SC	MW	x					WL only	Analytes and frequency modified pursuant to TRC Tech Memo (3/15/11)
EMW-28UC	SC	MW	x				TCE	Boundary well	No change
GAC-01	SC	PW						Remove from CGMP	To be abandoned
GAC-02	NC	PW			Cr/TCE			Interior well	Increase Cr frequency to better monitor trends
GAC-03	NC	PW	x		Cr/TCE			Interior well	Increase Cr frequency to better monitor trends
GMW-01	NC	MW	x		Cr/TCE			Interior well	Increase Cr frequency to better monitor trends
GMW-02	NC	MW	x		Cr/TCE			Interior well	Increase Cr frequency to better monitor trends
GMW-09MC	NC	MW	x		Cr/TCE			Interior well	Increase Cr frequency to better monitor trends
GMW-10LC	SC	MW	x			TCE		Upgradient well	Analytes and frequency modified pursuant to TRC Tech Memo (3/15/11)
GMW-10UC	SC	MW						Remove from CGMP	Analytes and frequency modified pursuant to TRC Tech Memo (3/15/11)
GMW-11LC	SC	MW	x				TCE	Interior well	No change

Groundwater Monitoring Program - Analytes and Frequency
Comprehensive Groundwater Monitoring Plan - September 2012

Well #	Subunit/ Location	Type	WL	Monthly	Quarterly	Semiannual	Annual	Description	Reason for Change
GMW-11UC	SC	MW	x			TCE		Interior well	No change
GMW-12LC	SC	MW	x					WL only	Analytes and frequency modified pursuant to TRC Tech Memo (3/15/11)
GMW-13UC	NC	MW	x		Cr/TCE			Interior well	Increase Cr frequency to better monitor trends
GMW-14UC	NC	MW	x		TCE		Cr	Interior well	No change
GMW-15UC	NC	MW	x		TCE		Cr	Boundary well	No change
GMW-16UC	NC	MW	x		TCE		Cr	Interior well	No change
GMW-17UC	NC	MW	x		TCE		Cr	Boundary well	No change
GMW-18UC	NC	MW	x			TCE	Cr	Boundary well	New well
GMW-19LC	NC	MW	x		TCE		Cr	Interior well	New well
GMW-20LC	NC	MW	x					Boundary well	New well
GMW-21UC	NC	MW	x			TCE		Upgradient well	Analytes and frequency modified pursuant to TRC Tech Memo (3/15/11)
GMW-22UC	NC	MW	x					WL only	Analytes and frequency modified pursuant to TRC Tech Memo (3/15/11)
GMW-23UC	NC	MW	x			TCE		Upgradient well	New well
GMW-25LC (installation pending)	NC	MW	x		TCE		Cr	Boundary well	New well (installation pending)
GMW-26LC (installation pending)	NC	MW	x		TCE		Cr	Boundary well	New well (installation pending)
INJSB-05	SC	MW						Remove from CGMP	Well casing blocked or damaged approx. 90' above top of screen (approx. 224'-264'). Downgradient wells provide sufficient delineation coverage.
I-101	NC	IW	x					WL only	No change
I-102	NC	IW	x					WL only	No change

Groundwater Monitoring Program - Analytes and Frequency
Comprehensive Groundwater Monitoring Plan - September 2012

Well #	Subunit/ Location	Type	WL	Monthly	Quarterly	Semiannual	Annual	Description	Reason for Change
I-201	SC	IW	x					WL only	No change
I-202	SC	IW	x					WL only	No change
I-203	SC	IW	x					WL only	No change
SB-06LC	SC	MW	x			TCE		Boundary well	Analytes and frequency modified pursuant to TRC Tech Memo (3/15/11)
SB-06UC	SC	MW				TCE		Boundary well	Analytes and frequency modified pursuant to TRC Tech Memo (3/15/11)
SB-07LC	SC	MW	x					WL only	Analytes and frequency modified pursuant to TRC Tech Memo (3/15/11)
SB-07UC	SC	MW						Remove from CGMP	Analytes and frequency modified pursuant to TRC Tech Memo (3/15/11)
SB-08LC	SC	MW	x			TCE		Downgradient well	Analytes and frequency modified pursuant to TRC Tech Memo (3/15/11)
SB-08UC	SC	MW				TCE		Downgradient well	Analytes and frequency modified pursuant to TRC Tech Memo (3/15/11)
SB-09LC	SC	MW	x			TCE		Downgradient well	Analytes and frequency modified pursuant to TRC Tech Memo (3/15/11)
SB-09UC	SC	MW						Remove from CGMP	Analytes and frequency modified pursuant to TRC Tech Memo (3/15/11)
SB-10LC	SC	MW	x			TCE		Downgradient well	Analytes and frequency modified pursuant to TRC Tech Memo (3/15/11)
SB-11LC	SC	MW	x			TCE		Interior well	No change
SB-12LC	SC	MW	x					WL only	No change
SB-13LC	SC	MW	x					WL only	No change
AST-INF	A	TS		Cr/TCE				GWET monitoring	No change
AST-EFF	A	TS		Cr/TCE				GWET monitoring	No change
GAC-2-INF	C	TS		TCE				GWET monitoring	No change
GAC-2-EFF	C	TS		TCE				GWET monitoring	No change

Notes:

Groundwater Monitoring Program - Analytes and Frequency
Comprehensive Groundwater Monitoring Plan - September 2012

Well #	Subunit/ Location	Type	WL	Monthly	Quarterly	Semiannual	Annual	Description	Reason for Change

* - Wells annotated with * will be analyzed quarterly through February 2013, and semiannually thereafter.

1 - Cr samples wil be analyzed both unfiltered and filtered.

2 - When Cr is a designated analyte, turbidity will be analyzed in the field.

3 - The TRC Tech Memo, dated 3/15/11, was approved by the ADEQ on 9/14/11. Table 1 of the memo lists the previously approved analytes and frequencies.

WL - water level

TCE - trichloroethene

Cr - chromium

MW - monitoring well

EW - extraction well

PW - production well

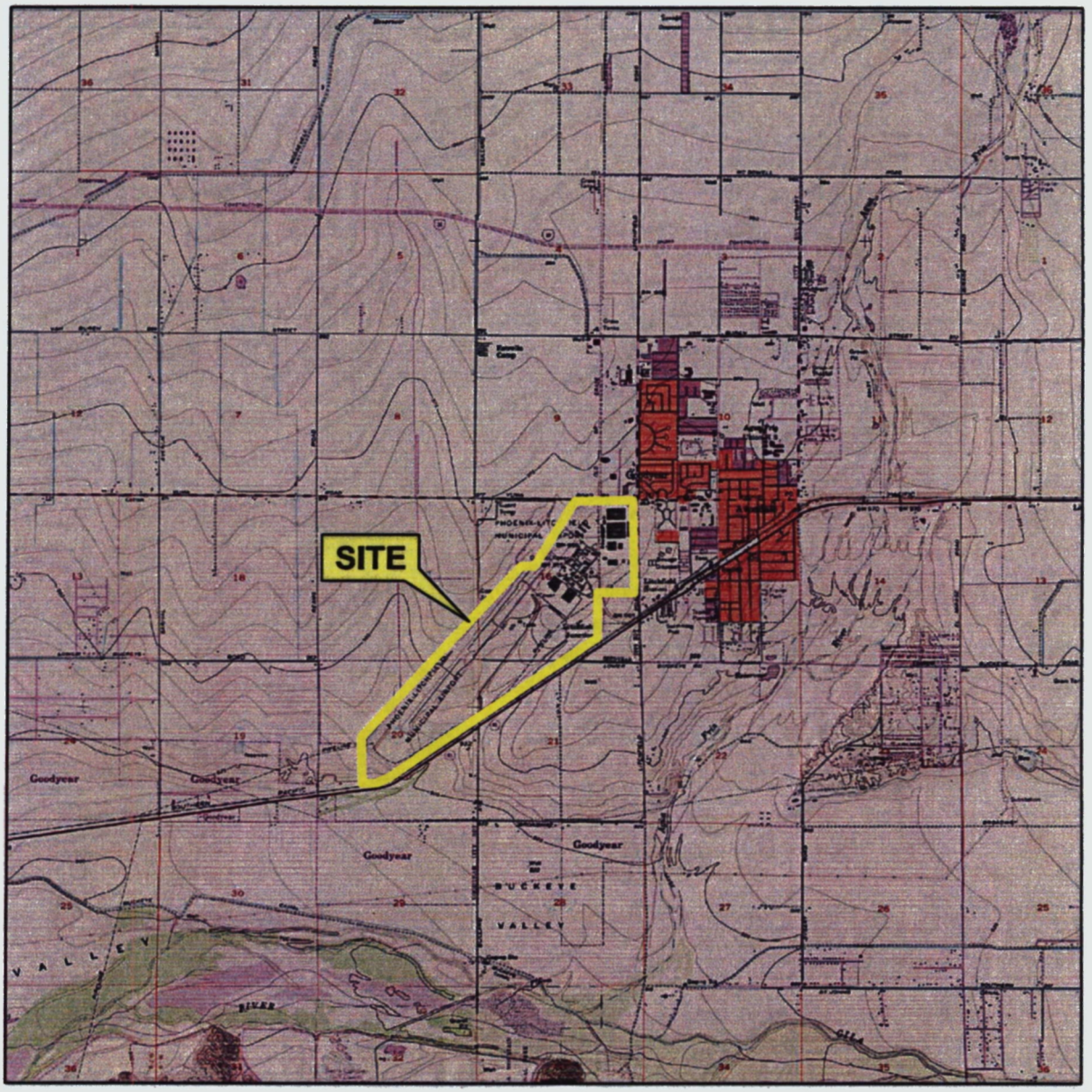
NC - northern Subunit C

SC - southern Subunit C

TS - treatment system

EO - extraction observation well

FIGURES

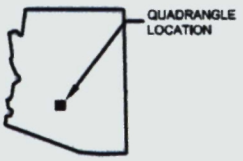


SCALE (MILES)

3 2 1 0 1 2 3

N

SOURCE:
United States Geological Survey
7.5 Minute Topographic Maps:
Tolleson Quadrangle, Arizona

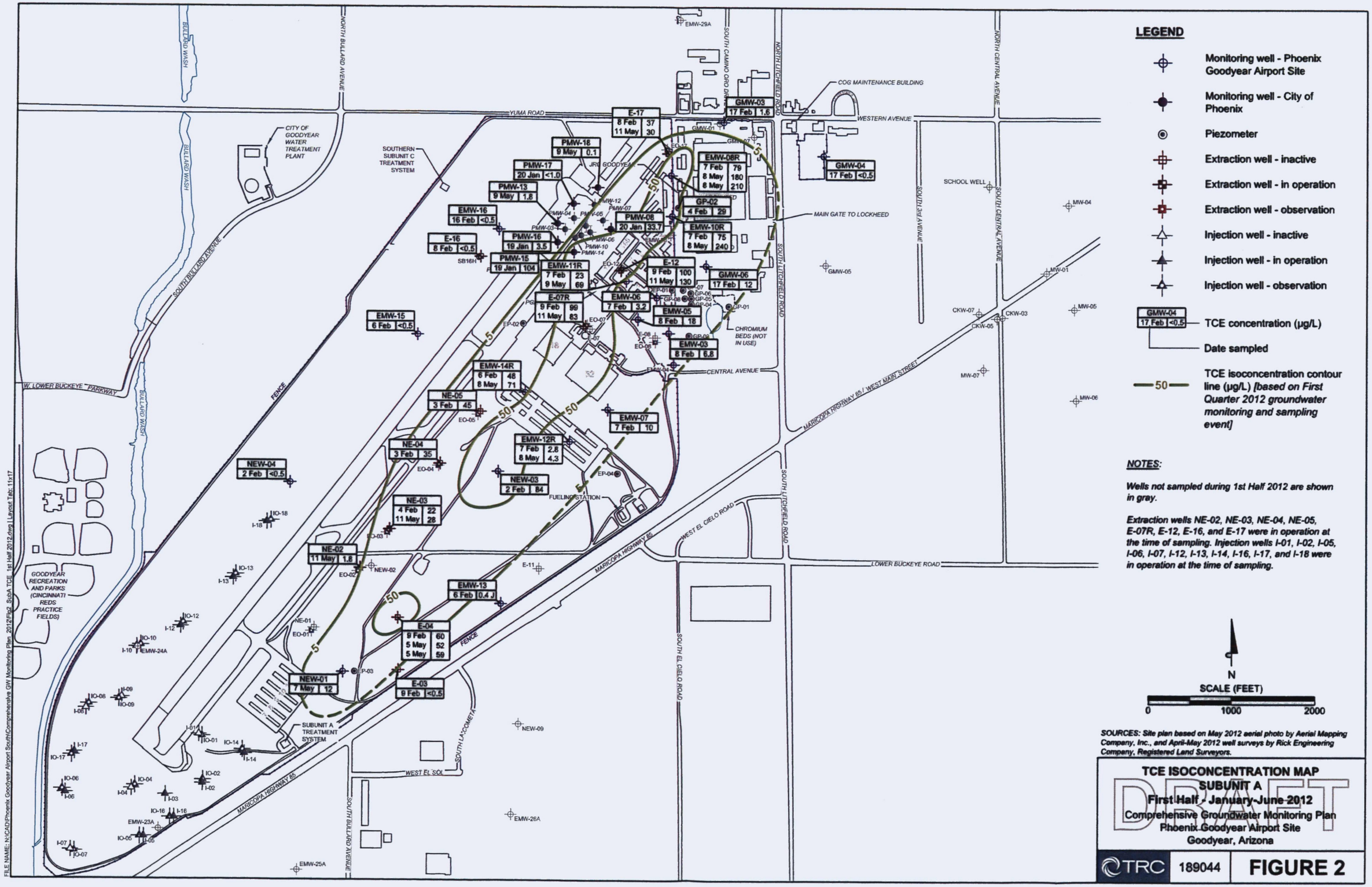


SITE LOCATION MAP

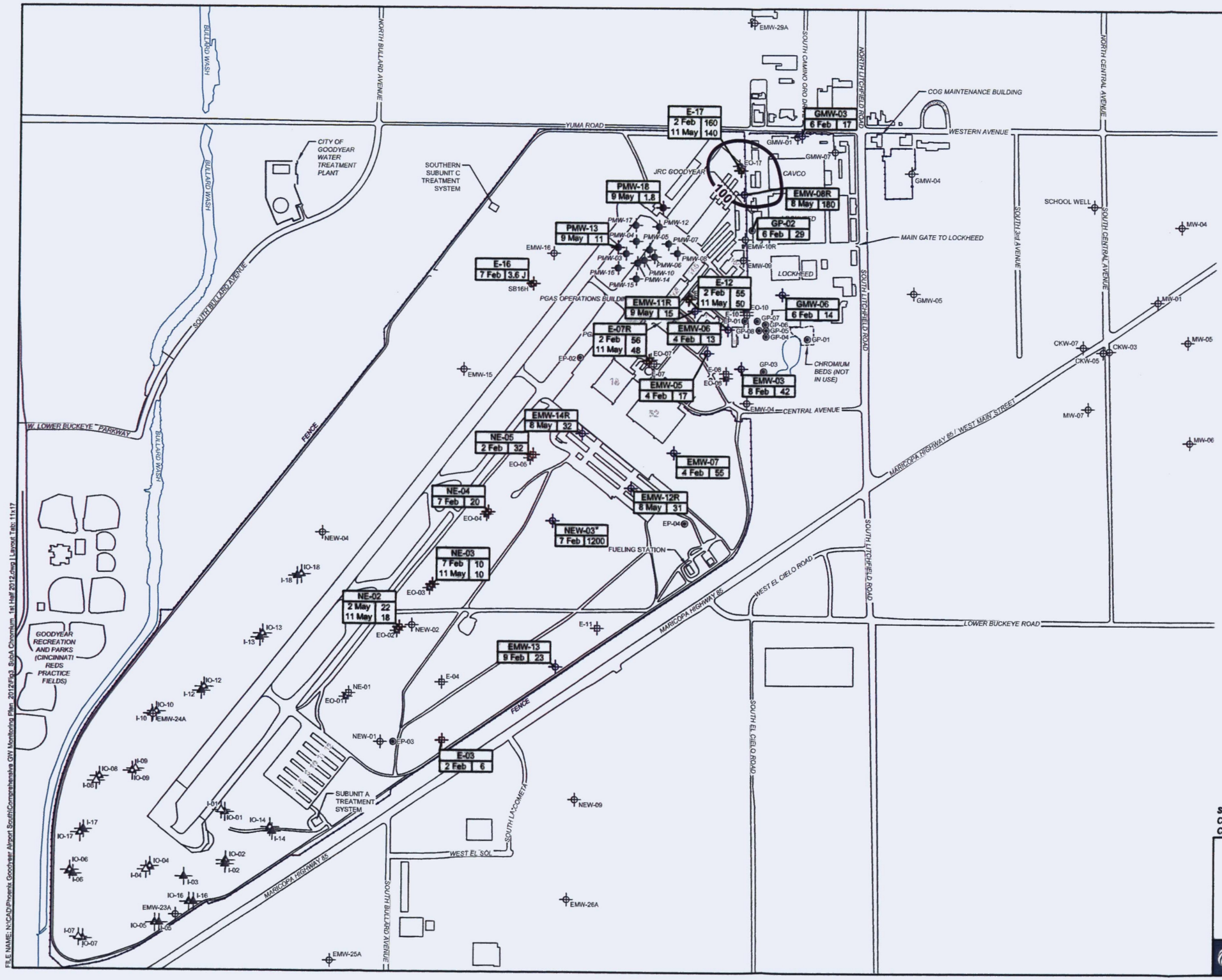
Phoenix Goodyear Airport Site
Goodyear, Arizona

TRC | 189044 | **FIGURE 1**

FILE NAME: N:\CAD\Phoenix Goodyear Airport South\Comprehensive GW Monitoring Plan_2012\Fig1_Site Location Map.dwg | Layout Tab: 8x11



FILE NAME: N:\CAD\Phoenix Goodyear Airport South\Comprehensive GW Monitoring Plan 2012\Fig2_SubA TCE 1st Half 2012.dwg | Layout Tab: 11x17



LEGEND

- Monitoring well - Phoenix Goodyear Airport Site
- Monitoring well - City of Phoenix
- Piezometer
- Extraction well - inactive
- Extraction well - in operation
- Extraction well - observation
- Injection well - inactive
- Injection well - in operation
- Injection well - observation
- GMW-06 / 6 Feb / 14 — Chromium concentration (µg/L)
- Date sampled
- —100— Chromium isoconcentration contour line (µg/L) *[based on First Quarter 2012 groundwater monitoring and sampling event]*

NOTES:

Wells not sampled during 1st Half 2012 are shown in gray.

J = Estimated value.

** = NEW-03 was not included in contouring due to high turbidity in sample. Total chromium was detected at 7.6 µg/L after laboratory filtering.*

Extraction wells NE-02, NE-03, NE-04, NE-05, E-07R, E-12, E-16, and E-17 were in operation at the time of sampling. Injection wells I-01, I-02, I-05, I-06, I-07, I-12, I-13, I-14, I-16, I-17, and I-18 were in operation at the time of sampling.

N

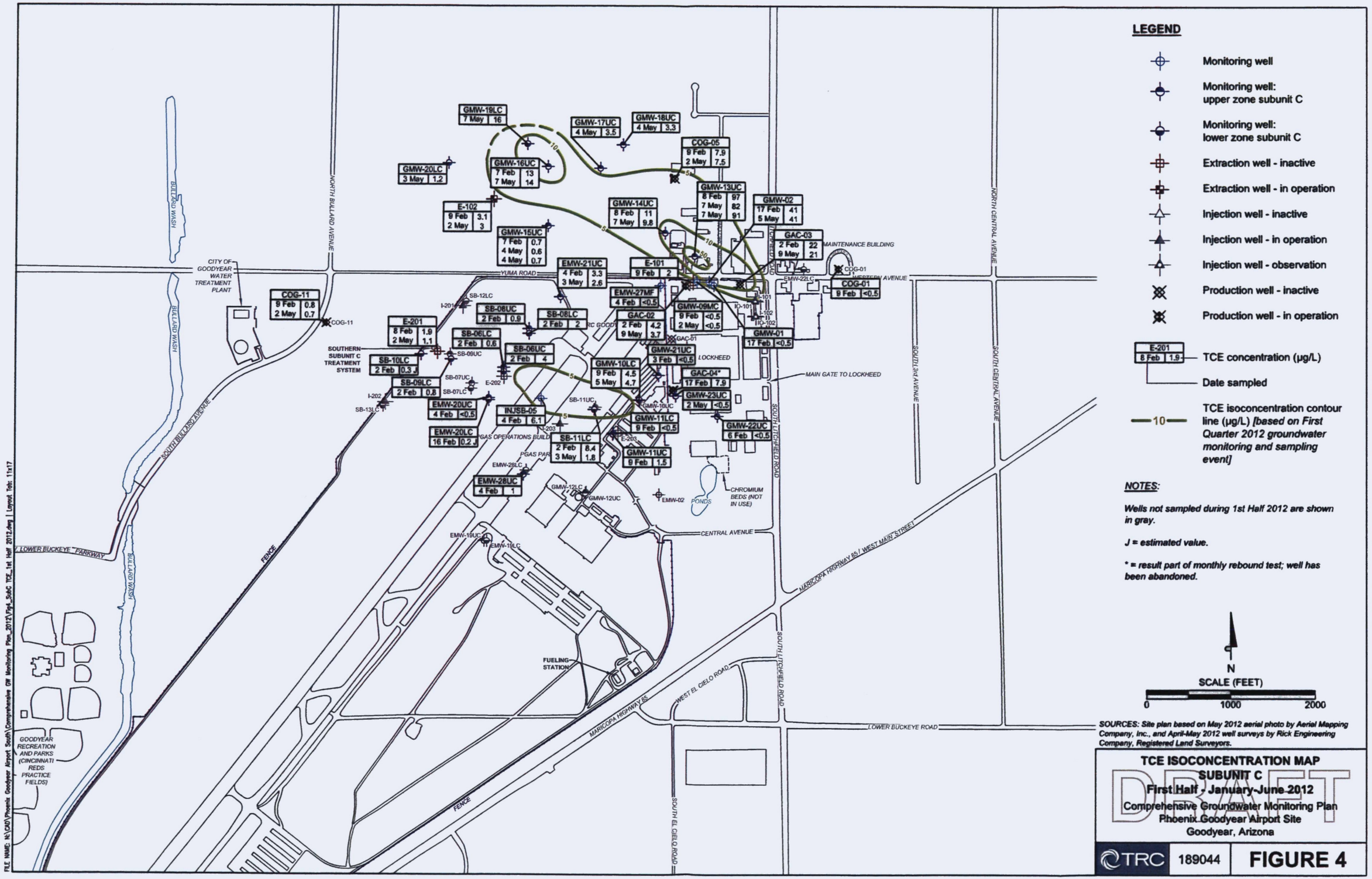
SCALE (FEET)

0 1000 2000

SOURCES: Site plan based on May 2012 aerial photo by Aerial Mapping Company, Inc., and April-May 2012 well surveys by Rick Engineering Company, Registered Land Surveyors.

CHROMIUM ISOCONCENTRATION MAP
SUBUNIT A
First Half - January-June 2012
Comprehensive Groundwater Monitoring Plan
Phoenix Goodyear Airport Site
Goodyear, Arizona

TRC 189044 **FIGURE 3**


GMW-19LC 7 May 16
GMW-17UC 4 May 3.5
GMW-18UC 4 May 3.3
GMW-16UC 7 Feb 13 7 May 14
GMW-20LC 3 May 1.2
COG-05 9 Feb 7.9 2 May 7.5
E-102 9 Feb 3.1 2 May 3
GMW-13UC 8 Feb 97 7 May 82 7 May 91
GMW-14UC 8 Feb 11 7 May 9.8
GMW-02 17 Feb 41 5 May 41
GMW-15UC 7 Feb 0.7 4 May 0.6 4 May 0.7
GAC-03 2 Feb 22 9 May 21
MAINTENANCE BUILDING
EMW-21UC 4 Feb 3.3 3 May 2.6
E-101 9 Feb 2
COG-01 9 Feb <0.5
EMW-27MF 4 Feb <0.5
GMW-09MC 9 Feb <0.5 2 May <0.5
COG-11 9 Feb 0.8 2 May 0.7
E-201 8 Feb 1.9 2 May 1.1
SB-08UC 2 Feb 0.9
SB-08LC 2 Feb 2
GAC-02 2 Feb 4.2 9 May 3.7
GMW-01 17 Feb <0.5
SB-06LC 2 Feb 0.6
SB-06UC 2 Feb 4
GMW-21UC 3 Feb <0.5
SB-10LC 2 Feb 0.3 J
GMW-10LC 9 Feb 4.5 5 May 4.7
GAC-04* 17 Feb 7.9
SB-09LC 2 Feb 0.8
GMW-23UC 2 May <0.5
EMW-20UC 4 Feb <0.5
INJSB-05 4 Feb 6.1
GMW-11LC 9 Feb <0.5
GMW-22UC 6 Feb <0.5
EMW-20LC 16 Feb 0.2 J
SB-11LC 2 Feb 8.4 3 May 1.8
GMW-11UC 9 Feb 1.5
EMW-28UC 4 Feb 1
CITY OF GOODYEAR WATER TREATMENT PLANT
SOUTHERN SUBUNIT C TREATMENT SYSTEM
BULLARD WASH
NORTH BULLARD AVENUE
YUMA ROAD
LOCKHEED
MAIN GATE TO LOCKHEED
SOUTH 3rd AVENUE
NORTH CENTRAL AVENUE
SOUTH CENTRAL AVENUE
WESTERN AVENUE
SOUTH LITCHFIELD ROAD
GAS OPERATIONS BUILD
PGAS PAR
CHROMIUM BEDS (NOT IN USE)
PONDS
CENTRAL AVENUE
FUELING STATION
MARICOPA HIGHWAY 85 / WEST MAIN STREET
WEST EL CIELO ROAD
LOWER BUCKEYE ROAD
SOUTH EL CIELO ROAD
SOUTH BULLARD AVENUE
LOWER BUCKEYE PARKWAY
FENCE
GOODYEAR RECREATION AND PARKS (CINCINNATI REDS PRACTICE FIELDS)
LEGEND
Monitoring well
Monitoring well: upper zone subunit C
Monitoring well: lower zone subunit C
Extraction well - inactive
Extraction well - in operation
Injection well - inactive
Injection well - in operation
Injection well - observation
Production well - inactive
Production well - in operation
E-201 8 Feb 1.9
TCE concentration (µg/L)
Date sampled
10
TCE isoconcentration contour line (µg/L) [based on First Quarter 2012 groundwater monitoring and sampling event]
NOTES:
Wells not sampled during 1st Half 2012 are shown in gray.
J = estimated value.
* = result part of monthly rebound test; well has been abandoned.
N
SCALE (FEET)
0
1000
2000
SOURCES: Site plan based on May 2012 aerial photo by Aeriel Mapping Company, Inc., and April-May 2012 well surveys by Rick Engineering Company, Registered Land Surveyors.
TCE ISOCONCENTRATION MAP
SUBUNIT C
First Half - January-June 2012
Comprehensive Groundwater Monitoring Plan
Phoenix Goodyear Airport Site
Goodyear, Arizona
DRAFT
TRC
189044
FIGURE 4
FILE NAME: N:\CAD\Phoenix Goodyear Airport South\Comprehensive GW Monitoring Plan_2012\Fig4_SubC TCE_1st Half 2012.dwg | Layout Tab: 11x17


GMW-19LC 9 Feb 41
GMW-20LC 6 Feb 9.4
GMW-18UC 7 Feb 11
COG-05 8 Feb 48
E-102 21 Feb 11
GMW-16UC 9 Feb 14
GMW-17UC 7 Feb 12
GMW-14UC 8 Feb 23
GMW-15UC 7 Feb 8.8
GMW-13UC 9 Feb 420
GMW-02 8 Feb 74
EMW-27MF 8 Feb 31
EMW-21UC 7 Feb 4.8 J
GAC-03 8 Feb 62
GAC-02 8 Feb 16
GMW-01 2 Feb 19
GMW-09MC 2 Feb 400
GAC-04* 2 Feb 5.7
GMW-23UC 16 Feb 7.8
NORTH BULLARD AVENUE
SOUTH BULLARD AVENUE
NORTH LITCHFIELD ROAD
SOUTH LITCHFIELD ROAD
NORTH CENTRAL AVENUE
SOUTH CENTRAL AVENUE
SOUTH 3rd AVENUE
WESTERN AVENUE
CENTRAL AVENUE
LOWER BUCKEYE ROAD
MARICOPA HIGHWAY 85 / WEST MAIN STREET
WEST EL CIELO ROAD
COG MAINTENANCE BUILDING
MAIN GATE TO LOCKHEED
LOCKHEED
JRC GOODYEAR
PGAS OPERATIONS BUILDING
PGAS PARKING
CHROMIUM BEDS (NOT IN USE)
FUELING STATION
CITY OF GOODYEAR WATER TREATMENT PLANT
SOUTHERN SUBUNIT C TREATMENT SYSTEM
FENCE
LEGEND
Monitoring well
Monitoring well: upper zone subunit C
Monitoring well: lower zone subunit C
Extraction well - inactive
Extraction well - in operation
Injection well - inactive
Injection well - in operation
Injection well - observation
Production well - inactive
Production well - in operation
GAC-03 8 Feb 62
Chromium concentration (µg/L)
Date sampled
100
Chromium isoconcentration contour line (µg/L) [based on First Quarter 2012 groundwater monitoring and sampling event]
NOTES:
Wells not sampled during 1st Half 2012 are shown in gray.
J = estimated value.
* = abandoned well.
N
SCALE (FEET)
0
1000
2000
SOURCES: Site plan based on May 2012 aerial photo by Aerial Mapping Company, Inc., and April-May 2012 well surveys by Rick Engineering Company, Registered Land Surveyors.
CHROMIUM ISOCONCENTRATION MAP
SUBUNIT C
First Half - January-June 2012
Comprehensive Groundwater Monitoring Plan
Phoenix Goodyear Airport Site
Goodyear, Arizona
DRAFT
TRC
189044
FIGURE 5
FILE NAME: N:\CAD\Phoenix Goodyear Airport South\Comprehensive GW Monitoring Plan_2012\Fig5_SubC Chromium_1st Half 2012.dwg | Layout Tab: 11x17

LEGEND

- Monitoring well - Phoenix Goodyear Airport Site
- Monitoring well - City of Phoenix
- Piezometer
- Extraction well - inactive
- Extraction well - in operation
- Extraction well - observation
- Injection well - inactive
- Injection well - in operation
- Injection well - observation
- EMW-06 — Wells sampled for both TCE and chromium
- NEW-03 — Wells sampled for TCE only

NOTES:

Wells not included in the Comprehensive Groundwater Monitoring Plan are shown in gray.

** = Well installation pending; location is approximate.*

N

SCALE (FEET)

0 1000 2000

SOURCES: Site plan based on May 2012 aerial photo by Aerial Mapping Company, Inc., and April-May 2012 well surveys by Rick Engineering Company, Registered Land Surveyors.

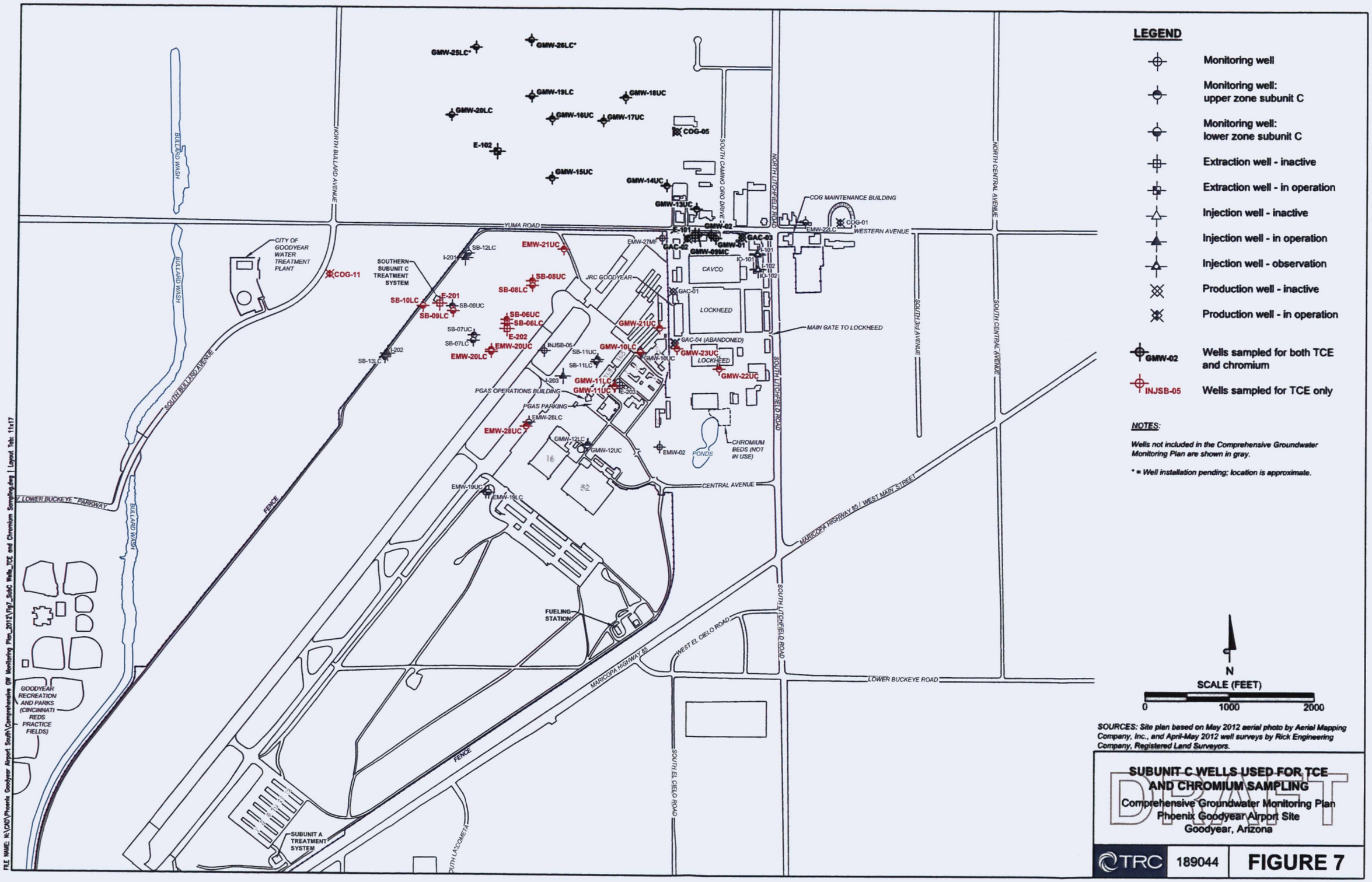
SUBUNIT A WELLS USED FOR TCE AND CHROMIUM SAMPLING

Comprehensive Groundwater Monitoring Plan
Phoenix Goodyear Airport Site
Goodyear, Arizona

DRAFT

TRC | 189044 | **FIGURE 6**

FILE NAME: N:\CAD\Phoenix Goodyear Airport South\Comprehensive GW Monitoring Plan_2012\Fig6_SubA Wells_TCE and Chromium Sampling.dwg | Layout Tab: 11x17



LEGEND

- Monitoring well
- Monitoring well: upper zone subunit C
- Monitoring well: lower zone subunit C
- Extraction well - inactive
- Extraction well - in operation
- Injection well - inactive
- Injection well - in operation
- Injection well - observation
- Production well - inactive
- Production well - in operation
- GMW-02 — Wells sampled for both TCE and chromium
- INJSB-05 — Wells sampled for TCE only

NOTES:

Wells not included in the Comprehensive Groundwater Monitoring Plan are shown in gray.

** = Well installation pending; location is approximate.*

N

SCALE (FEET)

0 1000 2000

SOURCES: Site plan based on May 2012 aerial photo by Aerial Mapping Company, Inc., and April-May 2012 well surveys by Rick Engineering Company, Registered Land Surveyors.

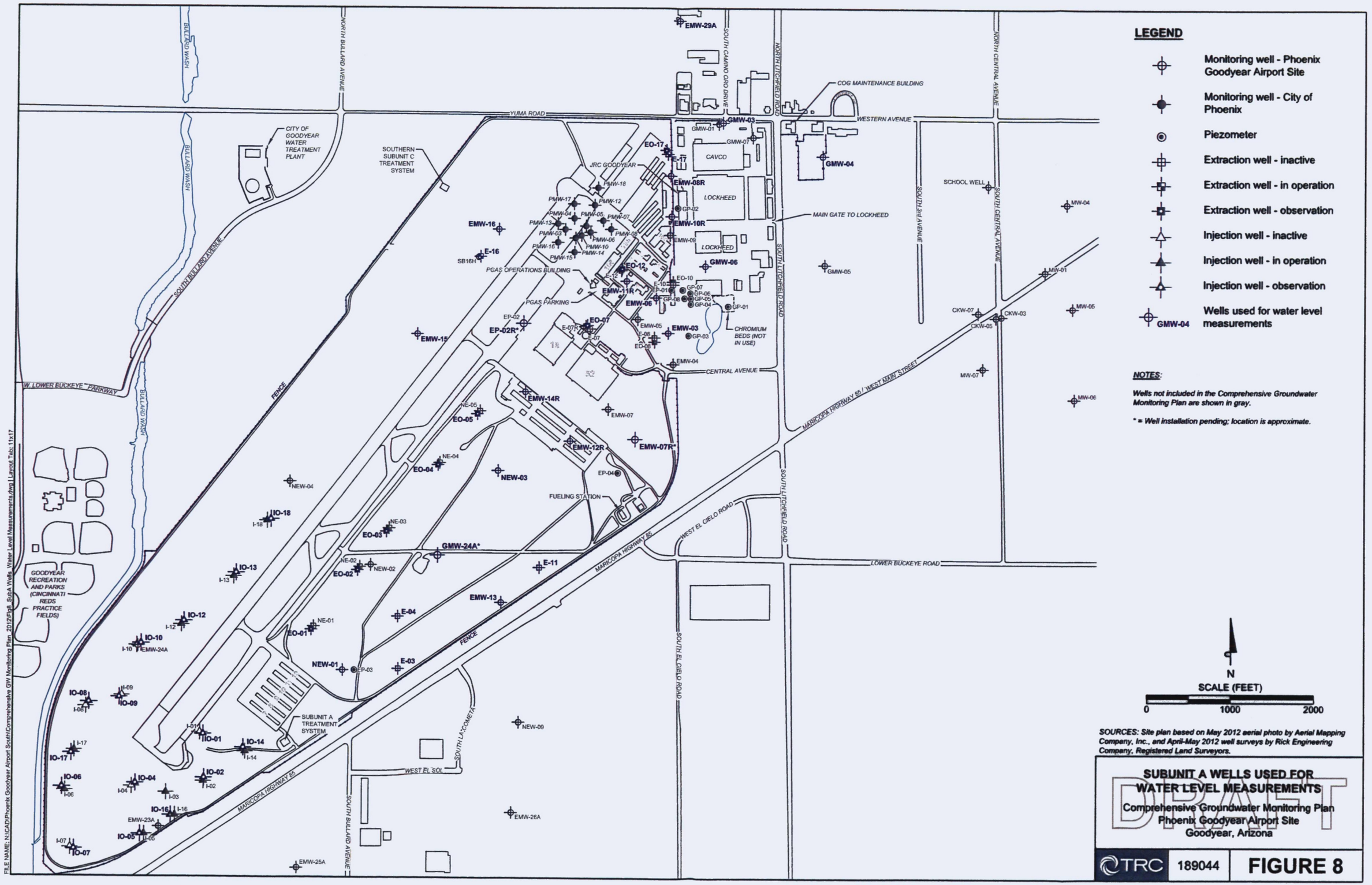
SUBUNIT C WELLS USED FOR TCE AND CHROMIUM SAMPLING

Comprehensive Groundwater Monitoring Plan
Phoenix Goodyear Airport Site
Goodyear, Arizona

DRAFT

TRC | 189044 | **FIGURE 7**

FILE NAME: N:\GIS\Phoenix Goodyear Airport South\Comprehensive GW Monitoring Plan_2012\Fig7_SubC Wells_TCE and Chromium Sampling.dwg | Layout Tab: 11x17



LEGEND

- Monitoring well - Phoenix Goodyear Airport Site
- Monitoring well - City of Phoenix
- Piezometer
- Extraction well - inactive
- Extraction well - in operation
- Extraction well - observation
- Injection well - inactive
- Injection well - in operation
- Injection well - observation
- GMW-04 — Wells used for water level measurements

NOTES:

Wells not included in the Comprehensive Groundwater Monitoring Plan are shown in gray.

**** = Well installation pending; location is approximate.***

N

SCALE (FEET)

0 1000 2000

SOURCES: Site plan based on May 2012 aerial photo by Aerial Mapping Company, Inc., and April-May 2012 well surveys by Rick Engineering Company, Registered Land Surveyors.

SUBUNIT A WELLS USED FOR WATER LEVEL MEASUREMENTS

Comprehensive Groundwater Monitoring Plan
Phoenix Goodyear Airport Site
Goodyear, Arizona

DRAFT

TRC | 189044 | **FIGURE 8**

FILE NAME: N:\CAD\Phoenix Goodyear Airport South\Comprehensive GW Monitoring Plan 2012\Fig8_SubA Wells_Water Level Measurements.dwg | Layout Tab: 11x17

LEGEND

- Monitoring well
- Monitoring well: upper zone subunit C
- Monitoring well: lower zone subunit C
- Extraction well - inactive
- Extraction well - in operation
- Injection well - inactive
- Injection well - in operation
- Injection well - observation
- Production well - inactive
- Production well - in operation
- EMW-02 — Wells used for water level measurements

NOTES:

Wells not included in the Comprehensive Groundwater Monitoring Plan are shown in gray.

** = Well installation pending; location is approximate.*

N

SCALE (FEET)

0 1000 2000

SOURCES: Site plan based on May 2012 aerial photo by Aerial Mapping Company, Inc., and April-May 2012 well surveys by Rick Engineering Company, Registered Land Surveyors.

SUBUNIT C WELLS USED FOR WATER LEVEL MEASUREMENTS

Comprehensive Groundwater Monitoring Plan
Phoenix Goodyear Airport Site
Goodyear, Arizona

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TRC | 189044 | **FIGURE 9**

FILE NAME: N:\GAD\Phoenix Goodyear Airport South\Comprehensive GW Monitoring Plan_2012\Figs_Sub\C Wells_Water Level Measurements.dwg | Layout Tab: 11x17

Appendix A
Summary of Well Construction Details
Comprehensive Groundwater Monitoring Plan - September 2012

Well Number	Subunit	Type of Well	Depth (ft)	Screened Interval (ft)	Casing Diameter (inches)
E-03	A	Monitoring Well	80	66 - 86	8
E-04	A	Monitoring Well	90	40 - 90	8
E-07R	A	Extraction Well	120	52 - 111	8
E-08	A	Extraction Well	98	75 - 95	8
E-11	A	Extraction Well	NA	NA	10
E-12	A	Extraction Well	120	60 - 110	12
E-16	A	Extraction Well	110	50 - 90	8
E-17	A	Extraction Well	130	55 -115	24
EMW-03	A	Monitoring	112	70 - 110	5
EMW-06	A	Monitoring	85	54 - 76	4
EMW-07R	A	Monitoring	Installation pending		
EMW-08R	A	Monitoring	100	60 - 100	4
EMW-09	A	Piezometric	69	43 - 64	4
EMW-10R	A	Monitoring	100	60 - 100	4
EMW-11R	A	Monitoring	100	60 - 100	4
EMW-12R	A	Monitoring	100	60 - 100	4
EMW-13	A	Monitoring	89	63 - 84	4
EMW-14R	A	Monitoring	100	60 - 100	4
EMW-15	A	Monitoring	78	52 - 74	4
EMW-16	A	Monitoring	83	56 - 78	4
EMW-29A	A	Monitoring	106	61 - 101	4
EO-01	A	Monitoring	110	36 - 95	1
EO-02	A	Monitoring	110	47 - 87	1
EO-03	A	Monitoring	110	36 - 76	1
EO-04	A	Monitoring	110	37 - 75	1
EO-05	A	Monitoring	110	50 - 90	1
EO-07	A	Monitoring	95	43 - 93	1
EO-12	A	Monitoring	90	40 - 90	1
EO-17	A	Monitoring	NA	NA	NA
EP-02R	A	Monitoring	Installation pending		
GMW-03	A	Monitoring	112	80 - 110	4
GMW-04	A	Monitoring	78	58 - 78	4
GMW-06	A	Monitoring	106	68 - 99	4
GMW-24A	A	Monitoring	Installation pending		
IO-01	A	Monitoring	110	30 - 70	1
IO-02	A	Monitoring	55	35 - 55	1
IO-04	A	Monitoring	110	36 - 90	1
IO-05	A	Monitoring	NA	NA	1
IO-06	A	Monitoring	110	28 - 88	1
IO-07	A	Monitoring	60	30 - 60	1
IO-08	A	Monitoring	110	55 - 95	1
IO-09	A	Monitoring	110	35 - 95	1
IO-10	A	Monitoring	110	45 - 99	1
IO-12	A	Monitoring	NA	NA	1

Appendix A
Summary of Well Construction Details
Comprehensive Groundwater Monitoring Plan - September 2012

Well Number	Subunit	Type of Well	Depth (ft)	Screened Interval (ft)	Casing Diameter (inches)
IO-13	A	Monitoring	NA	NA	1
IO-14	A	Monitoring	70	40 - 70	1
IO-16	A	Monitoring	NA	NA	1
IO-17	A	Monitoring	NA	NA	1
IO-18	A	Monitoring	NA	NA	1
NE-02	A	Extraction Well	91	65 - 85	8
NE-03	A	Extraction Well	90	55 - 85	8
NE-04	A	Extraction Well	95	70 - 90	8
NEW-01	A	Monitoring	100	50 - 90	4
NEW-03	A	Monitoring	110	50 - 85	4
NEW-04	A	Monitoring	100	45 - 80	4
PMW-06	A	Monitoring	90	50 - 90	4
PMW-08	A	Monitoring	90	50 - 90	4
PMW-15	A	Monitoring	98	43 - 93	4
PMW-16	A	Monitoring	90	45 - 90	4
PMW-17	A	Monitoring	90	40 - 90	4
COG-05	C	Production	501	225 - 480	16
COG-11	C	Production	400	250 - 380	20
COG-20	C	Production	357	172 - 342	20
E-101	C	Extraction Well	271	181 - 266	20
E-102	C	Extraction Well	295	195 - 285	12
E-201	C	Extraction Well	300	190 - 290	20
EMW-02	C	Monitoring	180	140 - 180	6
EMW-19LC	C	Monitoring	300	241 - 291	5
EMW-20LC	C	Monitoring	310	247 - 297	5
EMW-20UC	C	Monitoring	230	175 - 225	5
EMW-21UC	C	Monitoring	235	180 - 230	5
EMW-22LC	C	Monitoring	315	280 - 310	5
EMW-28LC	C	Monitoring	302	247 - 297	5
EMW-28UC	C	Monitoring	228	171 - 221	5
GAC-02	C	Extraction Well	286	180 - 280	20
GAC-03	C	Extraction Well	298	196 - 296	20
GMW-01	C	Monitoring	310	270 - 309	6
GMW-02	C	Monitoring	192	160 - 189	6
GMW-09MC	C	Monitoring	238	205 - 235	4
GMW-10LC	C	Monitoring	302	276 - 296	4
GMW-11LC	C	Monitoring	303	280 - 300	4
GMW-11UC	C	Monitoring	217	195 - 215	4
GMW-12LC	C	Monitoring	251	230 - 250	4
GMW-13UC	C	Monitoring	235	190 - 230	4
GMW-14UC	C	Monitoring	247	202 - 242	2
GMW-15UC	C	Monitoring	240	195 -235	2
GMW-16UC	C	Monitoring	246	201 - 241	2
GMW-17UC	C	Monitoring	247	202 - 242	2
GMW-18UC	C	Monitoring	225	180 - 220	2

Appendix A
Summary of Well Construction Details
Comprehensive Groundwater Monitoring Plan - September 2012

Well Number	Subunit	Type of Well	Depth (ft)	Screened Interval (ft)	Casing Diameter (inches)
GMW-19LC	C	Monitoring	322	280 - 320	2
GMW-20LC	C	Monitoring	281	240 - 280	2
GMW-21UC	C	Monitoring	220	180 - 220	2
GMW-22UC	C	Monitoring	220	180 - 220	2
GMW-23UC	C	Monitoring	225	182 - 225	4
GMW-25LC	C	Monitoring	Installation pending		
GMW-26LC	C	Monitoring	Installation pending		
I-101	C	Injection	297	186 - 291	12
I-102	C	Injection	300	185 - 285	20
I-201	C	Injection	300	190 - 290	12
I-202	C	Injection	288	178 - 258	12
I-203	C	Injection	300	190 - 290	12
SB-06LC	C	Piezometric	300	250 - 290	2
SB-06UC	C	Piezometric	250	190 - 230	2
SB-07LC	C	Piezometric	300	255 - 295	2
SB-07UC	C	Piezometric	246	190 - 230	2
SB-08LC	C	Monitoring	305	263 - 303	2
SB-08UC	C	Monitoring	233	188 - 228	2
SB-09LC	C	Monitoring	304	259 - 299	2
SB-09UC	C	Monitoring	235	190 - 230	2
SB-10LC	C	Monitoring	303	258 - 298	2
SB-11LC	C	Monitoring	304	255 - 295	2
SB-12LC	C	Piezometric	305	225 - 265	2
SB-13LC	C	Piezometric	302	225 - 265	2

NA - information not available